

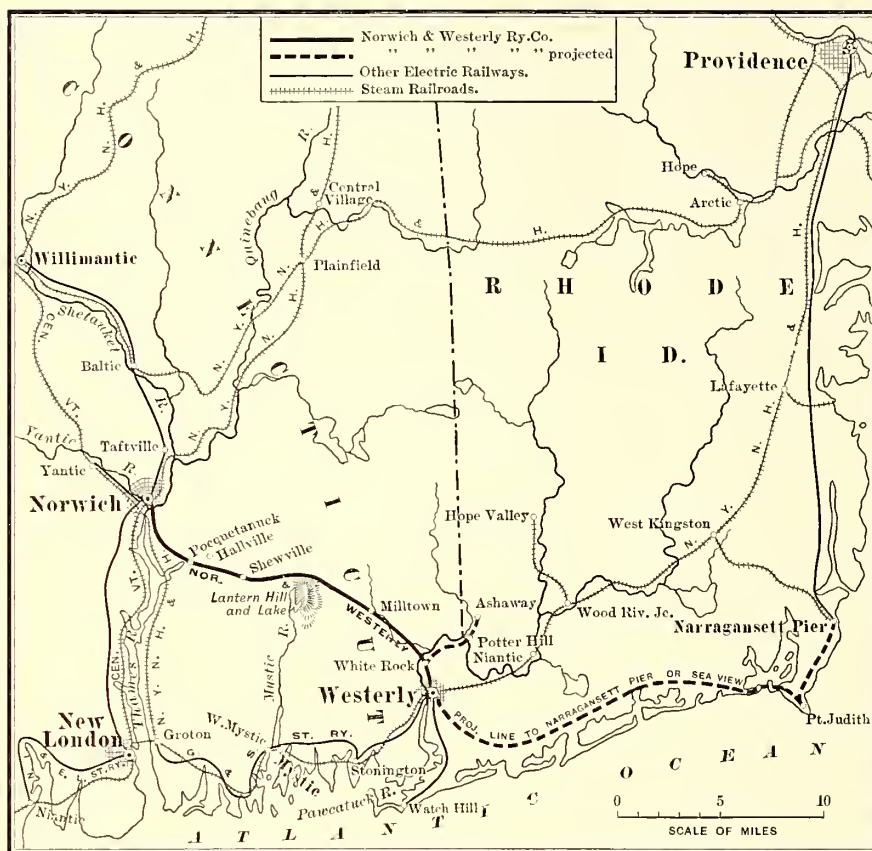
## THE NORWICH & WESTERLY RAILWAY

With the opening last fall of the Norwich & Westerly Railway between Norwich, Conn., and Westerly, R. I., citi-

sides a large part of that going beyond each terminal city, as to Willimantic. The company has another source of income from its privilege to carry freight and express right through Westerly, this being included in its twenty-five-year franchise. The running rights in Norwich cover the use of the local company's tracks for about 1200 ft. Compensation for this is on a car basis.

### THE ROUTE

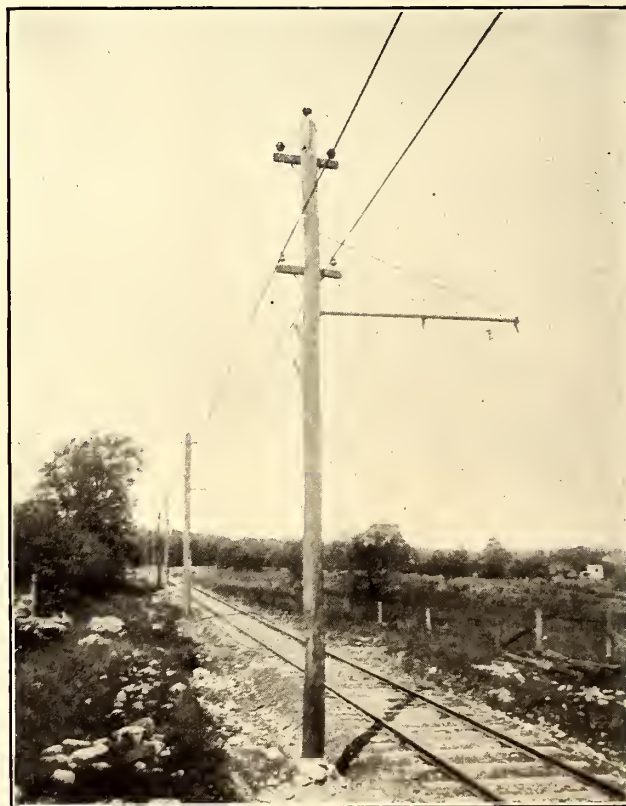
The line starts in the business district of Norwich within a few feet of the New York, New Haven & Hartford Company's station, with which, however, it has no rail connection. On leaving the town the railway enters on its own right of way, the public highway being used for only a small portion of the entire route between the main terminals. The first station is adjacent to the State Hospital for the Insane, 3.4 miles from Norwich, which harbors several thousand patients. About half a mile further there is a connection with the New York, New Haven & Hartford Railroad, at the village of Fox Point. The power station and car house are 0.4 mile from Poque-tanuck on a large tract owned by the company. Part of this area is wooded and has a small river which at present is used for water supply only, but later will help to form an attractive lake for boating, as the company intends to have an amusement resort at this place. North Stonington, the most important town along the line, is 10.4 miles from the power station. Some 3.7 miles beyond



MAP OF A PORTION OF EASTERN CONNECTICUT AND WESTERN RHODE ISLAND, SHOWING THE PRESENT AND PROPOSED ROUTES OF THE NORWICH & WESTERLY RAILWAY

zens of those States had the pleasure of riding for the first time on their pioneer high-speed interurban electric railway. To those familiar with the trend of interurban development in Ohio and Indiana it may be a surprise that one of the oldest and most thickly settled portions of the Union should have clung so long to city standards of construction. This, however, has been due to a variety of local causes, such as the larger proportion of riders living along the highway; the shorter distances between towns; the greater percentage of pleasure traffic for which speed and engineering considerations must often be subordinated to permit the full enjoyment of the scenery; and finally, the difficulty experienced in securing the franchises and right of way to compete effectively with the through service of the steam railroads.

An examination of the accompanying map, showing the steam railroads in this portion of Eastern Connecticut and Western Rhode Island, will reveal that before the construction of this electric railway the only rail connection between Norwich and Westerly was via New London on the steam railroad. Of course this is a round-about way, the steam railroad representing roughly two sides of a triangle of which the Norwich & Westerly forms the third. The length of this shorter route is 22 miles, which is traversed in 45 minutes by the limited cars and in 55 minutes by the locals. The trip via steam railroad requires one to one and one-half hours, depending on connections at New London. The fare on the latter is \$1.25, or \$0.27 more than on the electric line. Unquestionably the new railway will get most of the through traffic between the two cities, be-



TYPE OF OVERHEAD AND TRACK CONSTRUCTION ALONG THE RIGHT OF WAY

North Stonington is the sub-station. From the latter the distance from Westerly is only 2.1 miles. The total distance between the terminals is 21.6 miles, including 1200 ft. in Norwich and 800 ft. in Westerly.

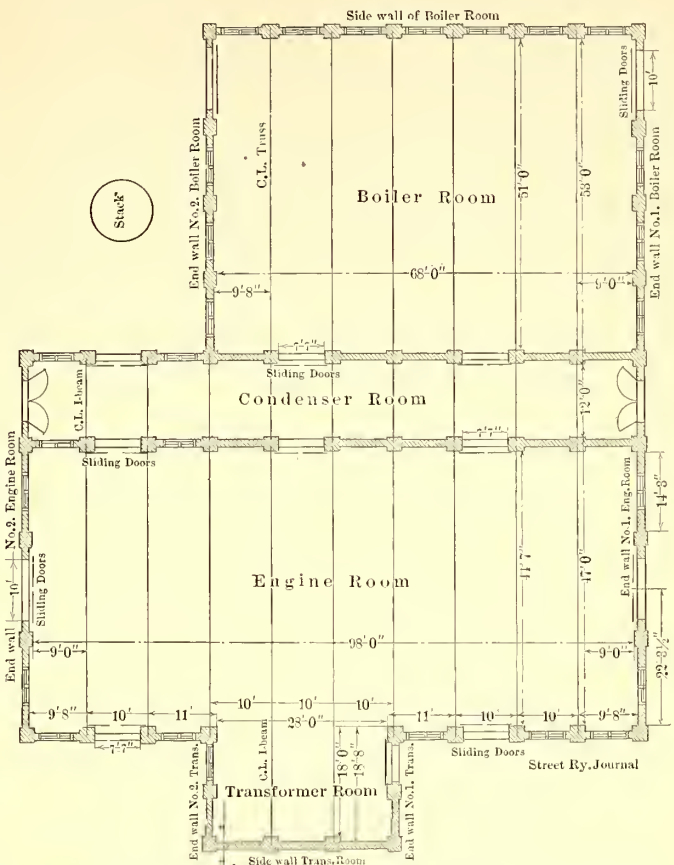
Although the Norwich & Westerly Railway is an inland line entirely, the rolling country through which it passes has induced quite a little pleasure riding. One of the most attractive places along the route is Lantern Hill, from which an excellent view of the surrounding hills and the nearby seacoast can be secured. During the coming spring the line will be extended for several miles from Westerly as far as the coast. This will greatly increase the traffic during the summer, as it will make available some fine bathing beaches.

#### ROADBED AND OVERHEAD CONSTRUCTION

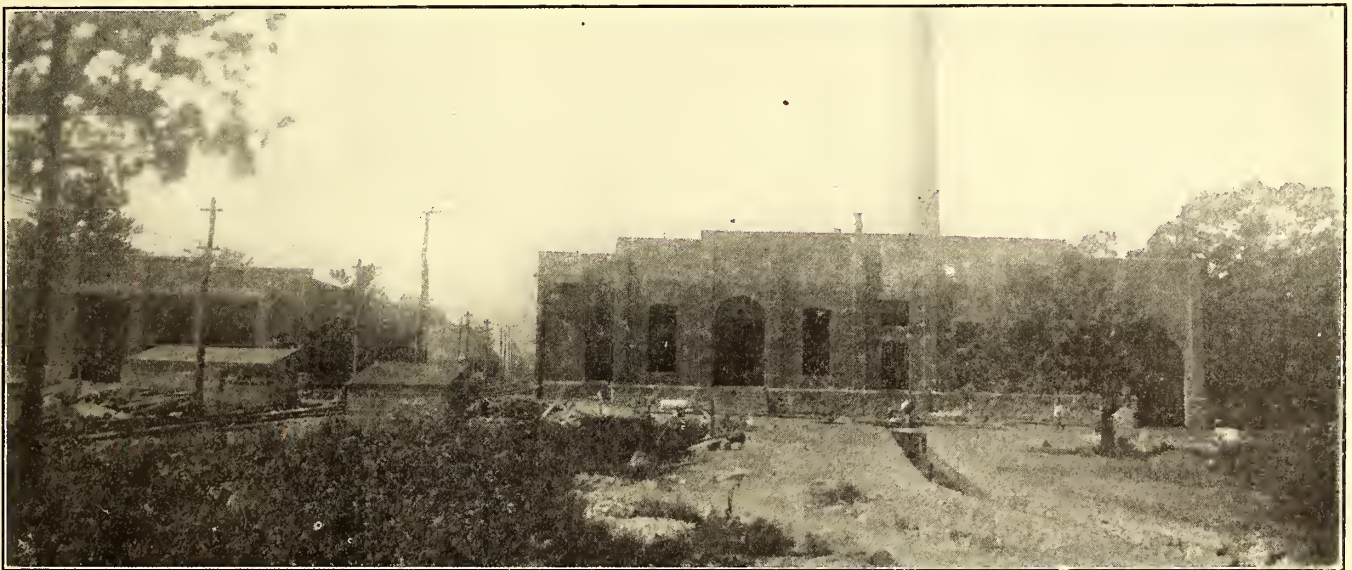
As the line was built primarily for high-speed operation, curves and grades are few in number. All curves have the outer rail elevated according to standard steam railroad practice for passenger train speeds. The maximum grade is 4.5 per cent. There are many cuts and fills on the line, some of the former being through rock. This disadvantage was balanced in one way, as it enabled the company to use a great deal of rock ballast. In fact, one of the accompanying views along the line shows clearly the rocky nature of this territory. Excellent gravel is also found in large quantities at different points along the line. Hence the abundance of good material also permitted the construction of unusually substantial fills.

In the open country the track consists of 70-lb. T-rails laid on wooden ties. The city sections are laid with 107-lb. girder rails to comply with the local regulations. The track is double bonded with two 0000 Chase-Shawmut soldered bonds. The overhead construction is principally of the side-pole type, carrying a 0000 trolley wire, a 500,000-

1860 hp and 1228 boiler hp, with an overload capacity of 50 per cent. The building is so designed that several additional units can be installed without disturbing any of the



PLAN OF POWER STATION OF THE NORWICH & WESTERLY RAILWAY COMPANY



CAR HOUSE AND POWER STATION OF THE NORWICH & WESTERLY RAILWAY

circ.-mil feeder and a 16,000-volt three-phase transmission line from the power house to the sub-station.

#### THE POWER STATION

The power house, as previously noted, is located on an extensive plot purchased by the company about 5 miles from Norwich. The accompanying illustration shows that it is a brick structure with one 7-ft.-diameter radial brick stack 175 ft. high. The plant is designed for a normal load of

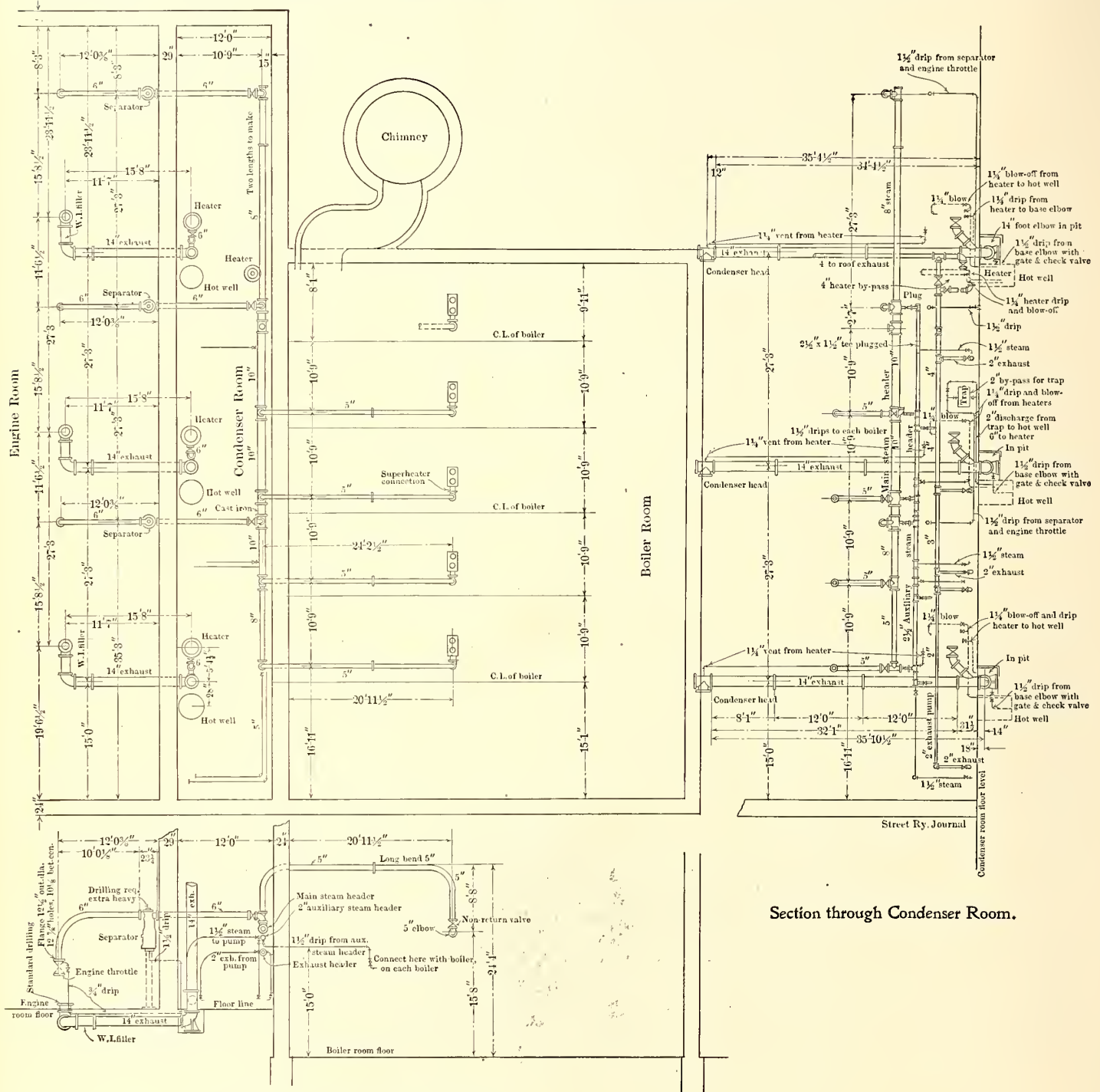
units now in use. The piping, feed pumps, valves and flue are also arranged to take care of the boiler and generating set to be added to the equipment in the near future. The piping and valves were laid out so flexibly that any or all of the boilers can operate with any or all of the engines. The engines can operate either condensing or non-condensing, and, likewise, the heater and economizer are so piped that they can be cut out of service without interrupting the service. The steam mains to the engines are provided with

Stratton separators. All steam piping is covered with Johns-Manville magnesia.

The boiler outfit consists of four 307-hp Franklin water-tube boilers for a working pressure of 160 lbs. Each boiler is furnished with a Foster superheater capable of raising the temperature of the steam 100 degs. Behind the boilers a 600-hp Green fuel economizer of 320 pipes has been in-

plan to a Goubert 300-hp primary feedwater heater. There is also a 250-hp feedwater heater of the same type to take care of the auxiliaries. The horizontal circulating condensing pumps and the two duplex outside-packed plunger boiler feed pumps were furnished by the Deane Steam Pump Company.

One of the illustrations shows the compartment where all



Section Boiler, Condenser and Engine Rooms.

PIPING SYSTEM FOR STEAM, EXHAUST AND DRIPS IN THE POWER STATION OF THE NORWICH & WESTERLY RAILWAY

stalled with the flue so arranged that the furnace gases can be conducted through the economizer or direct to the stack. This economizer was also designed with reference to future enlargement.

Each engine exhausts into a separate barometric Spirojector condenser made by the George F. Blake manufacturing Company. Every exhaust line is laid on the induction

valves, pumps, heaters and condensers are installed. This room is located between the boiler and engine divisions, and it will be noted that the apparatus in it is arranged for very easy access, unlike any other power houses where it is so difficult to get at the auxiliaries when something goes wrong. The placing of the auxiliary machinery in a separate room also keeps it free from the dirt of the boiler room.

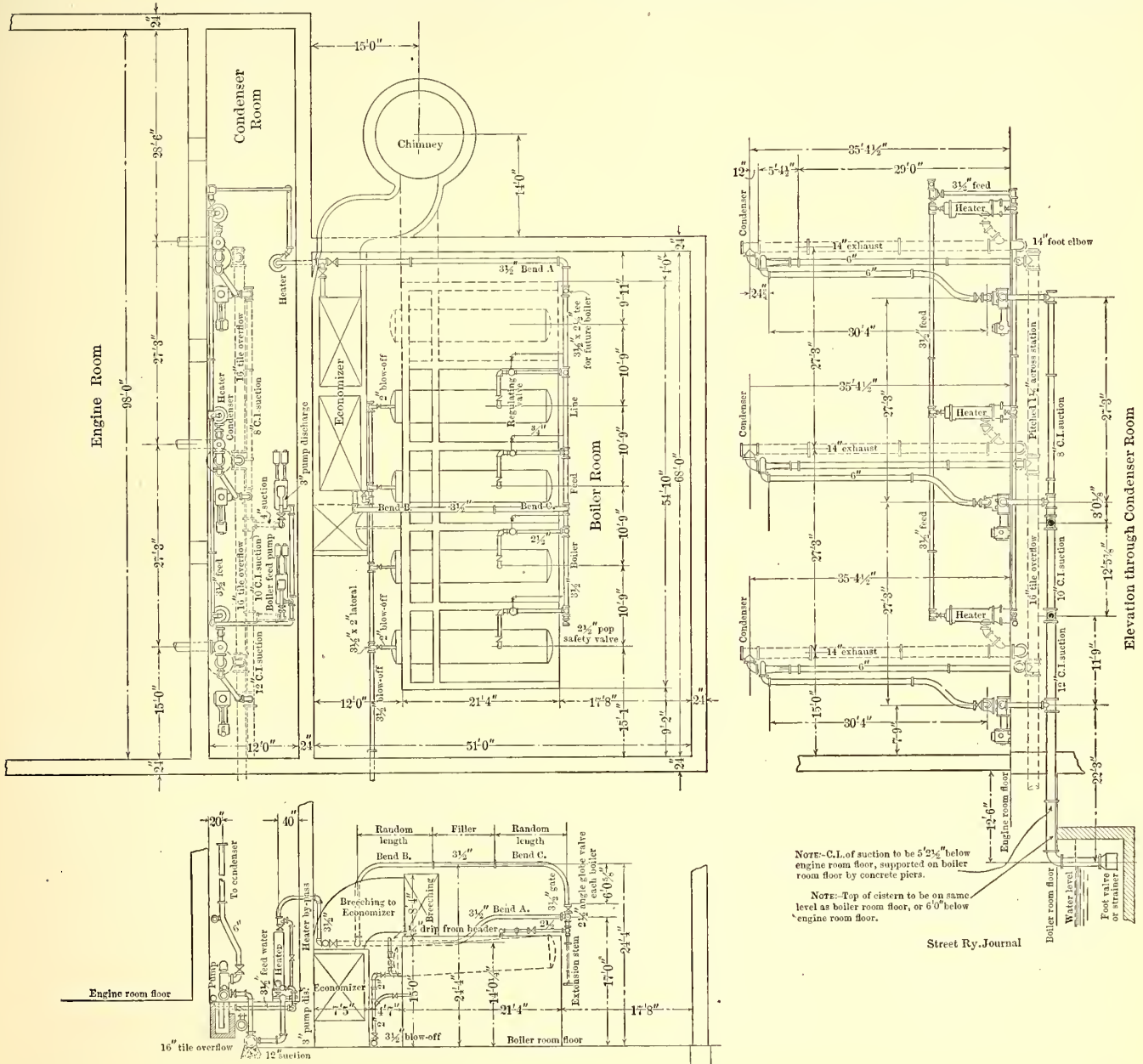
Coal is brought into the boiler room in charging cars running on a narrow-gage track led from an outside coal supply secured by dumping from cars which are run up a trestle outside the boiler house. The water for the boiler feed and circulating pumps is drawn from a specially constructed reservoir just outside the condenser room. This reservoir is fed by gravity from the neighboring stream, but which is tapped at about 500 ft. above the power house. This was done to insure as cool a temperature as possible and to prevent any possibility of the overflow from the hot wells discharging at a point in the stream where it could heat the circulating water.

The principal steam units consist of three cross-compound Hamilton-Corliss engines operating at 150 lbs. press-

generator connected to a Westinghouse standard engine. The other exciter set is of the same capacity but is driven by a three-phase, 25-cycle, 370-volt induction motor.

There are two 300-kw rotary converters giving 600 volts direct current at 500 r. p. m., equipped with starting motors and mechanical oscillators. There are also three 200-kw oil-insulated self-cooled transformers stepping up from 370 volts to 16,000 volts, used in connection with the transmission line to the sub-station.

The electrical apparatus is controlled from an eleven-panel switchboard. The panels are each 90 ins. high x 24 ins. wide x 2 ins. thick, built up in three sections of Vermont marble. All panels are mounted upon angle-iron framework supported on an angle-iron base. The instruments,



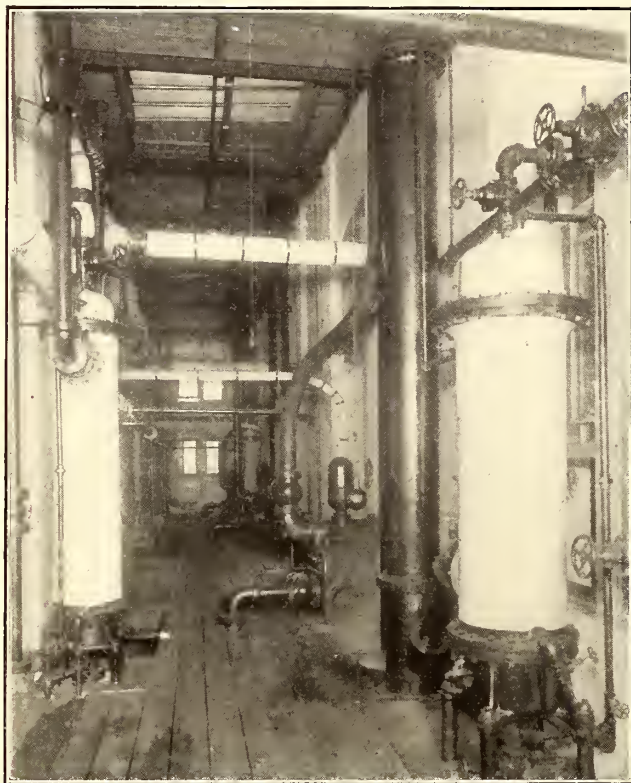
WATER-PIPING SYSTEM IN THE POWER STATION OF THE NORWICH & WESTERLY RAILWAY COMPANY

ure with 150 degs. superheat. Each of these engines is connected to three 400-kw three-phase revolving-field generators operating at 25 cycles, 370 volts, 107 r. p. m.

There are two exciter sets, each capable of exciting all three generators when operating at 50 per cent overload and 80 per cent power factor. One of these exciters consists of a 50-kw, compound-wound, 300-r.-p.-m., 125-volt

switches and metal parts are finished in dull black. Panel No. 1 controls the high-tension side of the step-up transformers; panel No. 2 controls the exciter sets, and has in addition to the usual instruments a four-pole double-throw switch whereby the station lights may be put on the exciter bus-bars or upon the lowering transformer from the generator bus-bars; panels 3, 4 and 5 each control one of the 400-

kw generators; panel No. 6 is a load panel and controls the high-tension side of the step-up transformers and besides the regular instruments contains a totalizing wattmeter; panels 7 and 8 control the a. c. end of the 300-kw rotaries; panels 9 and 10 are the d. c. rotary panels; panel No. 11 is a two-



CONDENSER AND PUMP ROOM

circuit d. c. feeder. Mounted on swinging brackets at the right and left of the eleven panel switchboards are a. c. high-tension voltmeters, a. c. low-tension voltmeters and synchroscopes.

Static protection is afforded by three low-equivalent lightning arresters with choke coils and the usual disconnecting switches. All of the electrical apparatus was furnished by the Westinghouse Electric & Manufacturing Company. The wiring in this station is of the slow-burning waterproof type required by the fire underwriters' latest specifications.

It will be noted from the foregoing description of the power house that the most careful arrangements have been made to provide for contingencies, both in the steam and electrical sections. The number of steam auxiliaries is also rather unusual for a railway station of this size.

An interesting feature in connection with this plant is the speed with which it was erected, owing to the railway company's desire to get a portion of the heavy fall travel in 1906. The contract covering the design and equipment of the steam portion of the plant was taken by the Washington Company, of New York, on Feb. 15, 1906, when ground had not been broken for the building. By May 15 all material was on the ground and on July 15 the first generating system was delivering power.

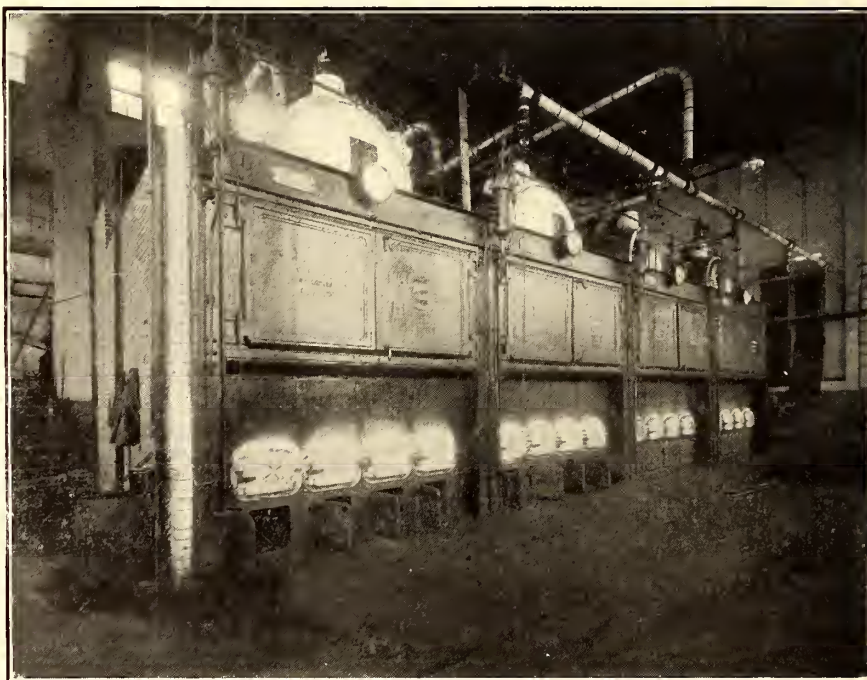
#### THE SUB-STATION

The sub-station is a small brick building located on the line 15 miles from the power plant or two miles from Westerly. It contains two 300-kw rotary converters equipped with starting motors and mechanical oscillators like those in the power house. There are also six 100-kw, oil-insulated, self-cooling lowering transformers to reduce the 16,000 volts transmitted to 370 volts for the rotaries. The primaries and secondaries of all transformers have caps to adjust the voltage to within 5 or 10 per cent.

The switchboard is of the same type as that used in the power station. It consists of two d. c. rotary panels, two a. c. panels, and one d. c. two-circuit feeder panel. All of these are duplicates of similar panels in the power house. There are also two high-tension panels for the control of the high-tension side of the step-down transformers. Aside from the usual apparatus on the panels there is an a. c. voltmeter mounted on a swinging bracket. Static protection is afforded by three low-equivalent lightning arresters with choke coils and disconnecting switches. The electrical apparatus manufactured in this sub-station is also of Westinghouse manufacture.

#### ROLLING STOCK

The high standard followed by the company in its track and power equipments was maintained in selecting the rolling stock. At present the equipment consists of four semi-convertible, four closed passenger cars and one motor freight car. Two of the closed cars are of the combination passenger and baggage type with folding seats for smokers in the baggage compartment, and the two others have a regular smoking compartment seating fourteen people. All of the closed cars have a toilet compartment. These cars are furnished by the Southern Car Company; they are about 47 ft.



BOILER ROOM IN THE POWER HOUSE OF THE NORWICH & WESTERLY RAILWAY

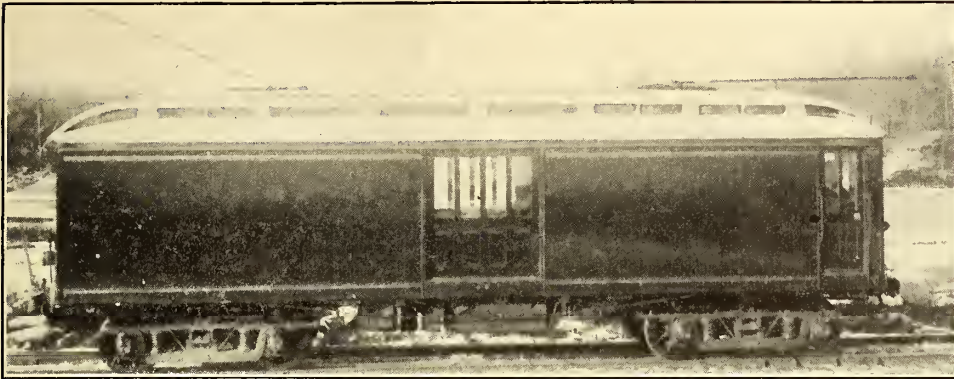
long and weigh, equipped, about 35 tons. They are furnished with end doors for convenience in train operation. The semi-convertible cars are fitted with Wheeler rattan seats and the closed cars with Heywood plush seats.

All of the cars are mounted on the Baldwin trucks of the 78-22 type. The wheel base is 78 ins.; diameter of axles, 5

in. at the motor bearings; journals,  $4\frac{1}{4}$  ins. x 8 ins. and 33-in.-diameter National steel-tired wheels. All of the features of the regular Baldwin type of truck are incorporated,

England, for some time. On certain trips of the day the cars are operated in trains and the rest of the day singly.

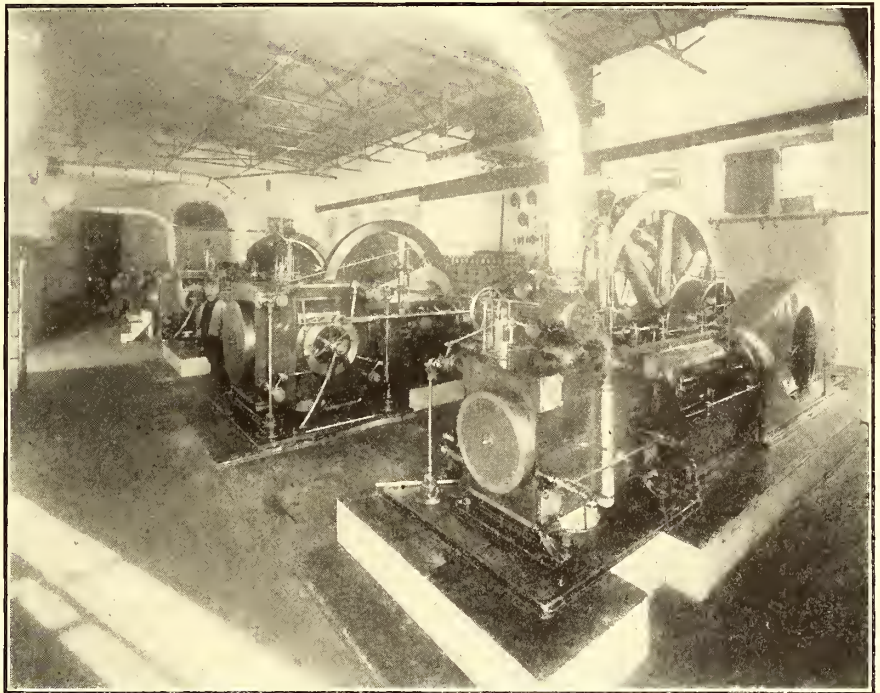
The braking equipment consists of the Westinghouse Traction Company's "A. M. T." automatic air brakes designed for use in trains of from one to five cars. They embody the graduated release of brake cylinder pressure and means to supplement with straight air release if desired, quick recharge of auxiliary reservoirs and quick service application of the brakes. Each equipment includes a D-2-E G motor-driven air compressor, capacity 24.29 cu. ft. free air per minute. Every car is also furnished with one Amer-



STANDARD EXPRESS CAR ON THE NORWICH & WESTERLY RAILWAY

among others the top member of the frame is of wrought iron forged solid in one piece; the transoms are of channel iron; the swing bolsters are adjustable for height and wear; there are double equalizer bars and trussed side frames. No member of these trucks is designed to withstand strains and stresses with less than a factor of safety of five. In spite of this high factor, the truck, owing to the careful distribution of weight, is comparatively light for the load carried, each truck complete weighing only 8000 lbs.

Both the freight and passenger cars are each equipped with four Westinghouse No. 112, 75-hp motors and unit switch control for train operation. The equipments are geared to maintain a schedule speed of 36.2 m. p. h. with stops every two miles approximately, thus giving a maximum speed of between 45 and 48 m. p. h. on level grades with 500 volts at the motor terminals. The equipments have been making these speeds, which is the fastest electric schedule in New



VIEW OF THE RECIPROCATING ENGINES AND DIRECT-CONNECTED GENERATORS IN THE POWER STATION OF THE NORWICH & WESTERLY RAILWAY COMPANY



A TRAIN ON THE NORWICH & WESTERLY RAILWAY, MADE UP OF TWO MOTOR CARS

ican automatic slack adjuster type-E-1 and standard train air signal equipment. In addition to this power braking the cars are furnished with vertical hand brakes made by John S. Baker, of Beverly, Mass. Among other details of the car furnishings are Knutson trolley retrievers and Van Dorn drawbars.

#### CAR DISPATCHING AND GENERAL

All cars are dispatched by telephone in accordance with regular steam railroad practice. The conductor on receiving orders fills out and signs the blank illustrated. The motorman receives and also signs a duplicate of the same order. These orders are turned in at the end of every run and examined daily by the traffic superintendent. This method has operated very successfully.

The Norwich & Westerly Railway was resurveyed, relocated, designed and equipped by the National Construction & Equipment Company, of New York, of which E. McKernan is president and E. W. Jackson is chief engineer and general manager.

#### NORWICH AND WESTERLY RAILWAY CO.

Telegraphic Train Order No. \_\_\_\_\_  
 Superintendent's Office, \_\_\_\_\_ 190  
 FOR DL. To G. & M. of \_\_\_\_\_ at \_\_\_\_\_ FOR DL.

CONDUCTOR AND MOTORMAN MUST EACH HAVE A COPY OF THIS ORDER.

Time received	By	Given to	By	Discharged
CONDUCTOR		MOTORMAN	TRAIN	MADE
				AT
				RECEIVED BY

STANDARD DISPATCH ORDER  
BLANK

## PROPOSED SUBWAYS IN PITTSBURG

E. K. Morse, of Pittsburg, recently presented a paper before the Engineers' Society of Western Pennsylvania on the subject of a proposed subway in Pittsburg. According to the speaker, the business district of Pittsburg now occupies a very congested area, only 210 acres in extent, between the Allegheny and Monongahela Rivers. This section is surrounded by water on all sides except to the east, where it is hemmed in by a ridge, which practically confines the business district to the space now occupied. To aggravate matters there is only one street in this district which is 80 ft. wide. Most of the others are 40 ft. and 50 ft. between building lines. All of the inbound cars must bring their passengers into and to this area.

Elevated railways are not considered suitable either in this district or elsewhere because of the narrowness of the streets, the grades which would have to be surmounted, and their interference with light, which in the smoky atmosphere of Pittsburg is a serious consideration. A subway is therefore recommended. Such a line could make a loop in the business district on Oliver Avenue, Liberty Avenue, Perry Street, Third Avenue and Grant Street. It would then extend east from the corner of Oliver Avenue and Grant Street in an almost straight line until reaching the corner of Penn Avenue and Franklin Avenue. For about a third of the distance it would extend under Center Avenue. It would then extend out Frankstown Avenue to Beachwood Boulevard. Mr. Morse recommends branches to be run south, one to Schenley Park and another to Brady Street; also a branch to extend from the down-town loop under the Allegheny River to Allegheny.

## PORTABLE TRANSFORMER STATION ON THE VALTELLINA RAILWAY

Among the interesting features of the three-phase system used on the Valtellina Railway, Italy, is a portable transformer sub-station, which is used either to take the place of a stationary transformer station when the latter is undergoing repairs or to help out portions of the line carrying unusually heavy loads. The transformer, which is of 430-kilovolt-ampere capacity, is mounted in a freight car built entirely of iron. The car body is divided in two unequal portions, the larger of which contains all the high-tension apparatus, as follows: Transformer, electrically-driven ventilator, three-pole hand-operated cut-out switch, three-pole automatic 20,000-volt oil switch, three two-pole hand-operated 3000-volt oil switches, three automatic cut-outs, relays, lightning arresters and choke coils.

The smaller compartment contains three hand wheels for the oil switches of the secondary circuit, and a hand wheel for the primary switch, as well as the bell and lamp signal apparatus of the relays which immediately indicate the cut-out switch opened. In this case, three secondary switches had to be installed, as at one point on the system the transformer station supplies current to three lines. Insulators are on the roof for both the primary and secondary circuits.

This portable transformer station can be connected to operate without auxiliary resistances in parallel with a stationary transformer, in which case the current divides in the ratio of 43:30. This scheme has been a success even in cases where this parallel connection was made from a sub-station more than 3-km distant and not at the place where some fixed transformer was cut out of the circuit.

## DOG PERMIT AT LITTLE ROCK

The people of Little Rock, Ark., probably because of a more affectionate disposition for animals than residents of other cities, for some time caused the Little Rock Railway & Electric Company considerable annoyance by bringing their dogs on the cars with them. On the Forest Park line, which extends several miles into the country, the practice was particularly troublesome. To check it the company adopted the policy of requiring the owners to

Form 322.

6 Bks. 11-1-06

Form 322.

6 Bks. 11-1-06

LITTLE ROCK RAILWAY &amp; ELECTRIC CO.

LITTLE ROCK RAILWAY &amp; ELECTRIC CO.

DOG PERMIT Little Rock, Ark. 190

DOG PERMIT Little Rock, Ark. 190

I hereby agree that no liability will be incurred by the LITTLE ROCK RY. & ELECTRIC CO. for dog or dogs.

Conductor \_\_\_\_\_ Line will allow bearer to carry \_\_\_\_\_ dog. Dog to be carried free and to be tied on front platform of car.

OWNER OF DOG \_\_\_\_\_

Good only until \_\_\_\_\_ 190 \_\_\_\_\_

ADDRESS \_\_\_\_\_

In accepting this Permit the owner of dog releases the L. R. Ry. & E. Co. from all liability.

Dog to be carried free and to be tied on front platform of car at owner's risk.

CONDUCTOR WILL TAKE THIS UP, CANCEL AND TURN INTO THE OFFICE WITH HIS REPORT.

Supt. Transportation.

CONTRACT FORM COVERING THE ISSUANCE OF DOG PERMITS BY THE LITTLE ROCK RAILWAY & ELECTRIC CO.

obtain special permit for every dog carried on the cars. These permits are issued free, but the fact that the owner must call at the office of the railway personally and sign a release relieving the company from liability for injury to the animal does much to discourage the practice. In fact, only about one-fourth the number of dogs are brought on the cars as were carried before permits were required. Under the conditions of the permit the dog is tied to the front platform, out of danger to and out of the way of passengers.